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Perspective Study of Bio-CNG In India

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ABSTRACT

It takes several of years for dead organisms to get converted into fuels. Continues usage of these fuels is the major concern of depletion of it. BioCNG is a purified form of biogas, in which all unwanted gases (> 95%) of pure methane gas are removed. BioCNG is exactly the same as the natural gas. In India, we have inadequency in fuel sources, so we depend on oil-rich countries. Today there is a burning need for alternative fuels because fossil fuels are getting vanished. It is therefore necessary to find another source of energy.A replacement to those exhausting resources can be made by using Bio CNG. Bio-CNG is a good automotive fuel and has lower emissions and makes it more environmentally friendly than biogas and other fuels.. Bio-CNG is much cheaper than other competitive fuels. The biogas produced from anaerobic digestion are further processed and hydrogen sulphide and carbon dioxide are removed so that the final product contains 90% - 95% methane to be used as BioCNG. IIf the Government of India focuses on Bio CNG, then there will be a reduction in imports of petroleum products, thus saving a significant amount of foreign exchange every year.

Keywords: Bio gas, Bio CNG ,Compressed Biogas ,alternative fuels

INTRODUCTION

Energy is an essential prerequisite for accelerated economic development and improved quality of life for citizens of any country.Natural gas is a popular fuel, because it is clean and safe. The usage of natural gas is increasing and the main component is methane.As per the Research Earth‟s average temperature has risen in the past century. If the trend continues, sea levels will rise, and scientists predict that floods, heat waves, droughts, and other extreme weather events are often possible.We know that Biogas is one of the most important renewableenergy sources and alternative for fossil fuels.

Biogas is produced by biomass anaerobic digestion such as cow dung, vegetable waste, municipal solidwaste, poultry faeces, industrial wastewater as welllandfill etc. The main products of anaerobic digestion arebiogas and slurry. In the formulation of biogas methane,carbon dioxide, hydrogen sulfide, nitrogen, oxygen,ammonia, chlorinated organisms, silanes, siloxane,phosphorus and other compoundscombinations are available.The biggest problem with biogas is its low energy and it is difficult and expensive to dissolve. This requires biogas compression at as high a pressure as possible.Gas retention is another concern as the cylinder becomes harder and stronger at high pressures. This can increase the weight of the cylinder and therefore affect its carrying capacity.

The European Union has proposed the introduction of 15% of the oil used for transportation in Bio-fuels and 10% for natural gas. Bio-CNG is an exciting fuel for both purposes. Bio-CNG production by digestion has been improved and is done (mainly) in small quantities. Due to the limited amount of suitable feed stock used, there is a need for the development of technology that can convert a wide range of biomass feed stocks into Bio-CNG.

BIO CNG COMPOSITION

Purified Biogas is called Bio CNG.Bio CNG is a natural renewable energy source and is made up of a variety of gasesMost of them are methane ⦃CH4⦄, Carbon Dioxide ⦃CO2⦄ with Hydrogen Sulfide and moisture. Composition of a typical Bio CNG sample is given in following table:

Table. 1: Composition of Bio CNG.

Parameters	% in Biogas
Methane (CH4)	92-98%
Carbon Dioxide (CO2)	2-8%
Hydrogen Sulfide (H2S)	<20 ppm
Moisture	<-40 deg

Calorific Value ~520000 kj/kg

Bio CNG is exactly similar to Natural Gas in composition and properties.Natural gas contains 75-98% methane with a small percentageof ethane, butane, propane and bio cng contains approximately 95% methane and 5% carbon dioxide. It is possible improve the quality of biogas by enriching its methane content. Methane is important constituent present in raw bio cng and is combustible. Raw Bio cng contains so many impurities. Among which removal of carbon dioxide, hydrogen sulfide and moisture are important for upgrading bio cng for vehicular application.

BIOGAS TO BIO CNG CONVERSION TECHNOLOGY

Biogas is produced from the anaerobic digestion of decomposing combustionbiomass contains major pollutants such as water,N_2, O_2, H_2S, NH_3, and CO_2 and so on. Therefore, biogas must be purified before it can be converted to bioCNG. In general, pressurized water pressure, swing adsorption pressure, chemical absorption, membrane penetration,heat swing adsorption, cryogenic method, physically absorption, and biological filtration methods are used to purify biogas before conversion.

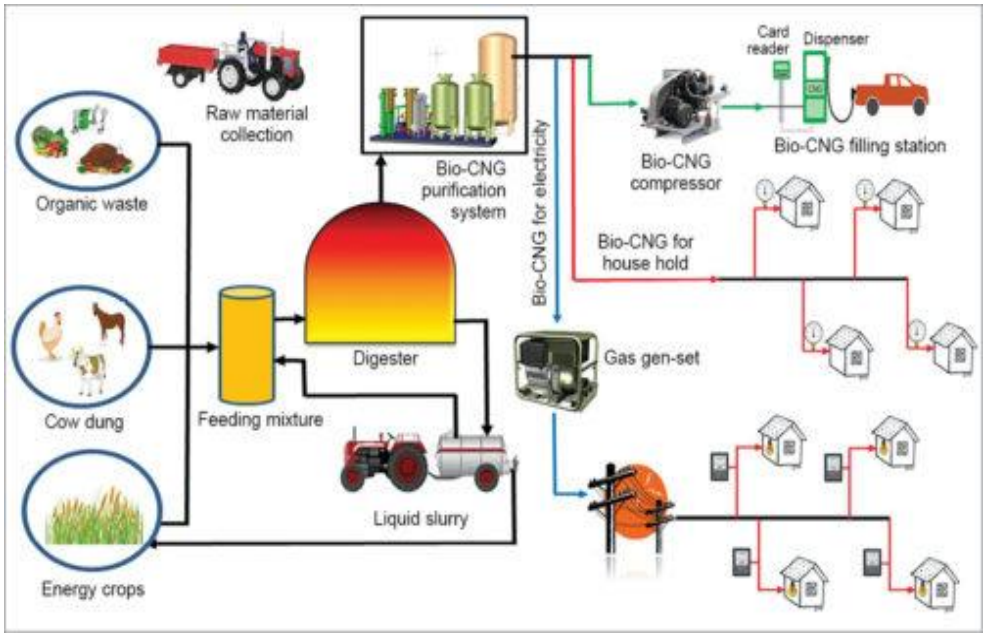

Figure 1:Bio CNG simple layout

Pressurized water scrubbing is the most commonly used method asoffers several benefits with a higher percentage of CH_4purity compared to other cleaning methods.In India, water scrubbingand membrane separation technology the most effective technology for the development of biogas based on technological costs and their maintenance.Purified biogas containing more than 97% CH_4 and 2% O_2 is considered for bio-CNG production.

Generally, two methods physical and chemical reactions used for this modification.Pure biogas is then heavily suppressed between 20 and 25 MPa and converted to bioCNG that lasts less than 1% of its normal volume.It is necessary to maintain bio-CNG as it affects the filling time of the vehicles,completeness of perfection, and the use of power.Generally,the last two systems such as temporary storage and cascade storageused in the filling station.Buffer storage maintains CNG pressure in the range of 20-25 MPa and gives CNG a maximum pressure of 20 MPa on the ride cylinders. In this case, all the filling stations dams are connected and maintained at the same pressure.

In contrast, the cascade storage system consists of three low, medium, and high pressure dams and provides CNG with three steps to car cylinders. when the pressure increases it enters the cylinder and eventually becomes a large weight pool to complete the filling process. Compared to the cascade dam, the bufferthe pool provides fast filling and charges 80% more gas.

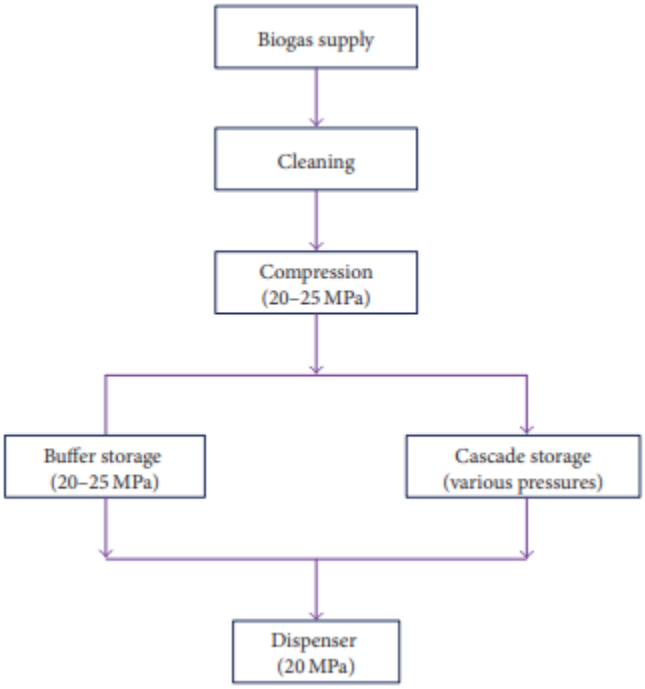

Figure 2:Outline of Bio-CNG production

POTENTIAL OF BIO CNG IN INDIA

Any valuable biological resources can be used to produce Bio-CNG. It is estimated that India has the highest number of cattle in India. If cow dung is properly collected, in the right way, and used properly, the produced Bio-CNG is likely to take up more than 4.0 millimeters. T of LPG per year. In addition, some other sources/feedstocks are very important in producing Bio-CNG that need to be tested in detail such as:

1. Piggery waste, poultry waste, etc
2. Biomass generated from agro-waste and other such sources straws, bagasse, etc.
3. Industries that can become significant contributors such as Distillery (Alcohol/Ethanol), food processing industries, etc
4. MSW, vegetable waste from Mandees and landfills
5. Garden waste, energy crops, etc
6. Biogas from Sewage Treatment Plant

The Bio-CNG project has a great advantage in that it can be easily replicated and easily deployed depending on the availability of feedstock. Power generation from BIOGAS is one of the best ways to meet the required energy. Energy from Bio-CNG can be easily stored and is not the same as wind, hydro and solar.

The pressure on biogas is exactly the same as the natural gas found commercially in its composition and energy. Due to the abundance of biomass in the country, pressed biogas have the potential to replace CNG in automotive, industrial and commercial use in the coming years. The production capacity of pressed biogas from various sources in India is estimated at 62 million tons per year and helps to reduce dependence on crude oil imports. Bio-CNG also has great promise for the efficient management of municipal solid waste and in addressing the problem of urban air pollution due to racial burns and carbon emissions. The Bio-CNG process also produces a rich fertilizer that can be used as a fertilizer. As Bio-CNG has a high calorie value and finds its use in explosive fats.

High potential industries for Biogas:
– Primary: Distillery, Sugar, and Starch (75% Biogas)
– Secondary: Pulp and paper, Milk processing, Slaughter house, and Poultry

Table. 2: BIOCNG potential

Biogas India Potential

1281 MWE	70 lac kg of CNG/LPG Per day	7 lac full –Tank cars daily

BIO CNG V/S LPG

The calorific value of Bio-CNG and LPG are nearly the same.LPG takes up more Oxygen(1.25) than Bio-CNG (1.11).LPG is heavier than air hence, settles down and is a potential fire threat. Bio-CNG, being lighter gets dispersed in the sir preventing any dangerous situation.Bio-CNG is cleaner than LPG and does not leave any soot deposits.Bio-CNG was more economical than commercial LPG. Finding use in Canteens/Pantries, Hotels.

Table. 3: Bio CNG V/S LPG

Parameter	Bio-CNG composition	LPG Composition	
Methane (min)	90%	Propane(min)	95%
Moisture(max)	5ppm	Butane(max)	4%
Sulphur(max)	16ppm	C5 and higher	2%
Oxygen(max)	0.50%	Sulphur(max)	5ppm
Carbon-dioxide (max)	4.00%	Free water	None
Net Caloric value (kcal/kg)	11,200 – 11,500	Net Calorific value (kcal/kg)	11,200

Bio-CNG V/S CNG

As per content, CNG and Bio-CNG are nearly the same except that CNG some higheralkanes Bio-CNG compares favourably with LPG in terms of the heat valueReplacement of CNG is possible and compares well in terms of heat value.

Bio-CNG asTransportation Fuel

The discovery of biogas conversion to bio-CNG as transport fuel depends largely on certain factors such as economic, technological, environmental and safety. Fuel properties of bio-CNG are almost identical to normal CNG as wellcompetitive compared to other motor fuels such as diesel and petrol. The percentage of methane (> 97%) in bio-CNG is higher than in natural gas (93%) produced in various gas fields.emissions can be reduced up to 90% with the help of BIO-CNG. The cost required for the production of BIO-CNG is approximately 50% of that of petrol and diesel.

Table. 4: CNG V/S Bio CNG

Parameter	CNG Composition	Bio-CNG Composition
Methane (min)	90%	90%
Ethane	6&	Nil

Table. 5: Bio CNG V/S FUEL

FUEL	Calorific value in KJ/Kg	Tarrif/Rate/Cost(INR)
CNG	53000*	55/-
BIO CNG	52000*	51.5/-
PETROL	48000*	94/-
DIESEL	44000*	85/-
LPG	49789*	14.2/-

*Slightly differs according to their hydrocarbons content
Tarrif rate is estimated cost

STATUS OF BIO CNG PLANT IN INDIA

According to renewable watch research, there are 17 Bio-CNG plants in the country, which include a total energy of 46,177 kg per day. Many of these plants are found in the western and northern parts of the country, accounting for about 96.5 percent of bio-CNG energy. These plants are still distributed in nine provinces, Maharashtra is the largest in terms of volume and the highest number of plants. Gujarat ranks second in ranks, while Rajasthan ranks second in terms of bio-CNG plants. Maharashtra and Gujarat together account for 63 percent of the world's bio-CNG.

In addition to these 17 plants, the National Agricultural Cooperative Marketing Federation of India is planning to build a bio-CNG facility near Azad Mandi in New Delhi, where Indraprastha Gas Limited (IGL) is ready to receive bio-CNG produced from this plant. In January 2018, the Punjab Bureau of Industrial Promotion and Punjab Energy Development Agency signed a MoU agreement with Indian Oil Corporation Limited (IOCL) to establish a biogas and bio-CNG project in the province, with a total investment of Rs.50 million. The provincial government plans to measure this up to 400 units over the next few years. The Department of Environment and Environment plans to launch a bio-CNG plant nationwide at a cost of Rs.70 billion, in partnership with the IOCL, Barat Petroleum Corporation Limited.

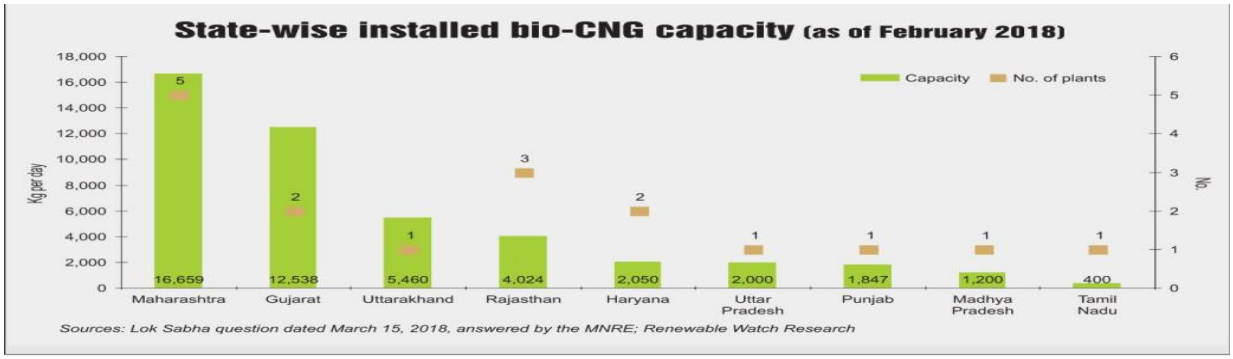

Figure 3: State wise installed bio CNG

OUTLOOK AND CHALLENGES OF BIO CNG TECHNOLOGY

Clearly the use of bio-CNG as a vehicle petrol provides significant economic benefits, in terms of emissions,and the concept of engine performance.But, they are not successful the implementation of this technology in a developing country Like is a big challenge. The need for self-sufficiency the number of supplies, equipment upgrades andcost, importance of technical capacity, and fuel consumption Infrastructure is considered a major obstacle to Transmission of bio-CNG .

- The cost of installing Bio-CNG is expensive. Eg. producing 400 kg / day of Bio-CNG requires a significant investment of Rs. 1.65 crores while 5000 kg / day requires Rs. 16 crores.
- Initial processes such as collection, transportation, and segregation can also reduce maintenance.
- It can only be installed where bulk waste is produced. It is a challenge to verify the waste sources of Bio-CNG production and it will not be compatible.
- The production process requires skilled professionals.
- There are no specific standards in India for the installation, operation and maintenance of these plants.

However, in the near future, the amount of waste generated in urban and rural areas, combined with government efforts to address this waste, will stimulate bio-CNG growth in India. To date, MNRE provides financial assistance in the research and development of all plants, including bio-CNG. Rs 10 million in funding is provided per MW of energy or per unit of bio-CNG from 12,000 cubic meters of biogas per day, for a total amount of Rs 50 million per project.

In addition, the Galvanizing Organic Bio-Agro Resources Dhan (GOBAR-DHAN) program, which aims to manage and convert cattle manure and solid waste into compost, fertilizer, biogas and bio-CNG, has been announced in Union Budget 2018 -19 and will be launched soon. . From April 2020, strict Bharat Stage-VI standards will be introduced to measure sulfur emissions. These rates will increase the cost of petrol and diesel, thus making CNG more costly for trucks and buses. Given the amount of garbage generated in the country, bio-CNG will definitely emerge as a viable option than CNG.

CONCLUSION

One of the most important environmental problems the world faces is waste management. The current-day emphasis is on reducing waste and revenue from product acquisition It is challenging to create a national market for home-produced Bio CNG in our country, with a limited national grid of gas.Therefore with the above benefits mentioned in BIOCNG it can be considered as a suitable substitute for current fuel such as petrol and diesel. more than a country like India which is one of the most polluted countries after China, USA and European countries there is an urgent need for this type of fuel conversion recently launched BIOCNG plant in the Indian city of Mahindra Chennai.There is a great need for this type of development not only in India but also globally this type of work contributes to the living life of humanity. In addition, it is necessary to take steps to build a bio-CNG distribution network now and to encourage government agencies for the creation of bio-CNGplants.

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